



## Evaluation of Backfill Aggregate Properties

### *Problem Description*

For retaining walls construction, TDOT often allows contractors to excavate behind a retaining wall and replace the existing soils with “select backfill” that has a higher friction angle and permeability which reduces the active earth pressure on the wall. TDOT currently requires that the active zone be excavated at 45o (1:1 slope) from two feet behind the heel of the wall or reinforced soil zone up to the finished grade. Although a 1:1 slope is considered an acceptable temporary slope for average soils in TN, it can be a very conservative approach, and costly, especially when a rock formation crosses the 1:1 slope. In addition, there is a need to study the methods of placement of backfill and develop a method of best practice for densifying aggregates. Thus, there is an urgent need to better define the range of expected friction angle values for Tennessee aggregate sources. Using the proper properties of aggregate will result in substantial saving in construction time and money on future projects across the state without compromising safety.

#### **PROJECT NUMBER:**

RES2024-05

#### **PRINCIPAL INVESTIGATOR:**

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#### **TDOT LEAD STAFF:**

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#### **PROJECT SCHEDULE:**

August 2023 to July 2025

### *Research Objectives*

The objectives of this research are as follows:

- Assess the influence of mineralogy, morphology, and gradation on the density and shear strength of fill aggregates from a wide range of supply sources in Tennessee.
- Conduct a parametric study using the Finite Element (FE) method to assess the distribution of active pressure behind retaining walls.
- Conduct cost analysis for the proposed revised guidelines and compare it with the current TDOT provisions.
- Develop provisions for the backfill of retaining walls.

### *Potential Implementation and Expected Benefits*

The project will offer much-needed improved provisions for TDOT to select the proper granular backfill materials and new provisions/ guidelines for the design of retaining walls. The results of this research will provide reliable laboratory measurements and detailed FE analysis for a better, safer, faster, and more economical design and construction of retaining walls. The new provisions can be implemented immediately in contract documents once they are reviewed and approved by TDOT technical staff members. The results of this research will be published in journal papers/conference proceedings and presented to technical committees during the annual Transportation Research Board (TRB) meeting for a broader impact and can be potentially used by other US DOTs.